

IC CARD SYSTEM WITH REMOVABLE IC MODULES

BACKGROUND

IC (integrated circuit) cards have been developed for a wide variety of different uses. Such IC cards typically include an IC with a memory element (ROM or RAM) and a control unit such as a microprocessor or microcomputer. The structure of the IC is such that the integrated circuit or IC is embedded in a portion of a plastic card having the dimensions and physical characteristics of standard credit cards in widespread use. The embedded IC includes a plurality of terminals on an exterior surface to permit the internal and external transfer of signals to and from the card. This is accomplished by inserting the card into a compatible reader which provides electrical contacts to connect the IC unit of the card to a card information processing unit associated with the reader. The reader also typically provides power for operating the card, and data is transferred to and from the card whenever it is inserted into the reader.

Since the memories in an IC card can be encoded to uniquely identify the card for a particular application, such cards may be utilized in a number of different application areas. When the sophisticated security features of such cards are employed, the cards may be used as an access key for computer systems, data bases and data networks, or for physical access control to hotel rooms, factories, offices or the like. IC cards increasingly are used for accessing automated bank terminals and permit translation information to be updated each time a transaction is made; so that the card uniquely tracks the authority of the user by information which is written into the memory of the IC circuit embedded in the card.

IC cards also may be utilized as small convenient, portable files, or records for any number of different types of information, such as personal telephone directories, detailed medical profiles, and the like. IC cards also are ideal for use as point-of-sale credit or debit operations, either in on-line or off-line systems, such as point-of-sale terminals in grocery stores, public telephones and the like.

Essentially, IC cards comprise tiny portable computers programmed to perform specific functions in accordance with the particular system with which such cards are designed for use. Standards have been developed and continue to evolve covering the overall size, electrical characteristics and other parameters for such cards. Typically, such cards are of the generally standard size of plastic credit cards, that is approximately 2 $\frac{1}{4}$ " wide by 3 $\frac{1}{2}$ " long with a thickness of approximately .09". Slight variations in these dimensions exist, but currently available IC cards are close to this size. Variations currently are present in the manner in which data is read into or from the cards, so that cards developed by different manufacturers for use in different systems require readers which are configured to operate with the card of the particular manufacturer.

As such IC cards become more prevalent, the current development is such that consumers will carry numerous IC cards, each designed for use in a specific system or for a specific purpose, in the same manner as they now carry numerous magnetic striped credit cards.

In an effort to reduce the number of IC cards an individual may be required to carry, techniques have

been developed to segment the IC card microprocessor and memory to permit the use of part of the data and/or programs by different services. This reduces the number of IC cards needed. A number of patents disclose systems directed to various techniques for providing this segmentation of the microprocessors and memories of the cards. For example, U.S. Pat. Nos. 4,709,137; 4,734,568; 4,742,215; 4,751,732; 4,802,218; and 4,831,245, disclose such systems. All of these systems require, at the time of card issuance, either a pre-reserved use of program and/or memory or additional downloading of a microcode after the card issuance. No subsequent changes are possible, either by way of additions or deletions, once this has been done.

It also should be noted that IC cards periodically wear out like conventional credit cards and therefore must be replaced. Obviously, such IC cards are more expensive than ordinary credit cards because of the embedded microcomputers and memories which are provided in them. At such time a card becomes worn out, the services which were accessible with that card cannot be accessed until the card is replaced. For some transactions, such as bank machine transactions, this is a significant inconvenience, since the data stored in the IC card is of a dynamic nature and is not static.

It is desirable to provide an IC card system capable of reducing the number of IC cards in circulation, or required to be carried by an individual, providing simultaneous on-line utilization of several different IC units, and further providing a convenient way of replacing a worn out IC card while retaining the current data status of the various IC circuits or units used with the card.

SUMMARY OF THE INVENTION

It is an object of this invention to provide an improved IC card system.

It is another object of this invention to provide an improved IC card which reduces the number of IC cards required for multiple different types of transactions.

It is an additional object of this invention to provide an improved IC card system capable of use with different host computers or different programs selected by individual removable IC components in the card.

It is a further object of this invention to provide an IC card which enables the user to individually and easily insert and remove IC modules in the card to permit the card to be utilized simultaneously with several different applications via a single I/O device.

In accordance with the preferred embodiment of this invention, an IC card includes a card body of a predetermined thickness which has a network of bus conductors located within the card at a depth less than the predetermined thickness. An inlaid information processing unit is provided in the card and interconnects with the bus conductor. The inlaid processing unit also has external signal connection terminals on it for interconnection with an external device. Open receptacles are provided on the card extending from its surface to the network bus conductor to expose the network bus conductor in the bottom of the receptacles. Removable information IC processing units are configured to fit into the receptacles to make electrical contact with the network bus conductor, and these removable IC units are held in place in contact with the bus conductor by a slideable cover.